

PATRIOT IDSS Program Technology at Redstone Arsenal

Supporting Operation Iraqi Freedom

CAPT. JAMES O. MCLINNAHAM, USA • DR. DENNIS G. BEELER

As far back as 1993, DoD had a vision that handling tough diagnostic jobs would entail the use of experts who may be on the other side of the world from the weapon system being diagnosed. In February 1993, Program Executive Office Air Defense, and the Office of the Secretary of Defense signed a Memorandum of Agreement to use PATRIOT as a test bed for what was to become the Integrated Diagnostics Support Demonstration (IDSD) program. The IDSD program, which integrated Commercial-off-the-Shelf (COTS) and Government-off-the-Shelf (GOTS) technology, was tested over a three-year period using tactical PATRIOT systems in both CONUS and OCONUS. Drawing on high-technology experience from PATRIOT, other systems, and the commercial world, IDSD integrated satellite communications; expert system technology; remotely controlled Test, Measurement and Diagnostic Equipment (TMDE); electronic publications; digital video; and computerized data acquisition.

In 1996 the IDSD program, upon successful completion, transitioned into what is now known as the Integrated Diagnostics Support System (IDSS). Between 1996 and 1998, IDSS underwent another series of unit tests, which stressed the technology from the soldiers' point of view. From the beginning of the IDSD/IDSS program, acceptance of the concept of improving maintenance by utilizing technology steadily



PATRIOT Integrated Diagnostics Support System (IDSS) Technology—Experts a world away help keep Operation Iraqi Freedom PATRIOT systems up and running.

improved. The overall IDSS evaluation demonstrated that integrating the basic building blocks of personal computers, test equipment, and communications provided a framework for effective system support and low-cost growth of additional capabilities.

Results of the IDSS evaluation indicated that the goals for maintenance enhancement could be attained, and that soldiers were very enthusiastic about using these new tools and technology. Access to up-to-date information was

found to be instrumental in returning weapon systems to an operational status. Computers normally used to assist in the troubleshooting and analyzing of data were also found to potentially reduce errors and speed up procedures.

Initial Fielding of IDSS

From Oct. 26, 1999, to Nov. 5, 1999, the PATRIOT Project Office (PPO) conducted an initial fielding at Fort Bliss, Texas, of the IDSS technologies to the Ordnance Missile and Munitions Center and School (OMMCS) Training De-

McLinnaham is the Assistant Program Manager for Logistics assigned to the Lower Tier Project Office, Air and Missile Defense, Huntsville, Ala. He is Level-III certified in Contracting, and Level-II certified in Program Management. Beeler is the Integrated Diagnostics Support System Division Manager for CAS, Inc., Huntsville, Ala. He holds a B.A. in Business, an M.S. in Contract and Acquisition Management, and a Ph.D. in Business Administration.

tachment. On Oct. 20, 1999, the PPO, now a part of the Lower Tier Project Office (LTPO), received a final go-ahead from the OMMCS Commandant that set the stage for fielding to the Training Detachment.

The fielding effort began with disassembly of seven PATRIOT Automated Logistics System (PALS) AN/PSM-80 (V)1 computers in order to install sound cards and Institute of Electronic and Electrical Engineers 488.2 Instrument Interface cards, which provide audio and instrumentation support for the various IDSS functions. The computers were then re-assembled, and upgraded hard drives with the IDSS software enhancements were installed. The new software includes Microsoft Windows '95 Operating System; Interactive Authoring Display System based on PATRIOT Interactive Electronic Technical Manuals; Procomm by Quarterdeck to allow data file transfers using the Single Channel Ground/Airborne Radio System tactical radios; Symantec pcAnywhere for file application sharing and remote access and control; and Microsoft NetMeeting to facilitate voice communications among nodes on the new PATRIOT Local Area Network (LAN).

The second week of the process consisted of detailed training for personnel from OMMCS and Raytheon Training Systems on the use of the entire IDSS system. IDSS field analysts began the session by giving the students a detailed overview of the IDSS programs. Following the overview, they taught each student the process of setting up the LAN, and how to use the IDSS system using the latest technology. The students were also taught the setup of the required modernized TMDE used in the performance of the Computer Aided Procedures developed by CAS, Inc., specifically for the IDSS program. They also demonstrated the capability of being able to remotely control the test equipment and monitor troubleshooting efforts from other locations external to the unit.

In early 2000, the LTPO decided to upgrade the older computers to new

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Dell 7500 laptops. To that end, they initiated procurement and obtained the new Dell laptops as replacements for the PALS computers. This represented a major upgrade for the soldier in the field, since the new Dell laptops had a newer operating system, more memory, and larger hard drives.

Expanding and Applying the IDSS Technology

During Desert Storm, the limited data that were recorded by non-tactical portable data recorders and other prototype equipment in the PATRIOT systems had to be sent back to the States for analysis via courier service or shipped via Federal Express. This method of getting data back for analysis took anywhere from two to 14 days, depending on the method used. Problems also existed due to more stringent import/export controls. It became apparent early on that a method was needed to expedite the data from remote locations anywhere in the world back to the analysts in the United States.

IDSS personnel from CAS, Inc., took this need to the CAS system engineers and asked for assistance in resolving this

issue. System engineers using IDSS technology designed a secure satellite communications system capable of transferring the data from remote locations back to CAS servers. Once this was in place, the data-reduction analysts were able to download the necessary data from the servers located in the Air and Missile Defense Data Analysis Network (AMDAN) facility. This new methodology provides the capability for sending data, voice, and video in a secure mode to the central AMDAN facility.

Not only does this technology provide the logistical data needed, it also provides a wealth of operational information for the analysts. Embedded Data Recorder (EDR) data can provide such information as whether or not a particular engagement was successful (and if not, why?). If anomalies exist, the data-reduction analysts will be able to detect those anomalies and system engineers will be able to provide feedback as to corrective action needed. This corrective action may be in the form of a software improvement to a particular item within the system or to support the issuance of a field bulletin back to the units in the field.

The EDRs, when available, enable evaluation to determine specific aspects of functional areas of hardware and software as well as overall system effectiveness. Without this data, critics could argue, as they did after Desert Storm, that PATRIOT was not effective. However, the greatest benefit of recorded data is in the investigation of anomalous events. Recorded data can be quickly distributed to analysts at Raytheon, Lockheed Martin, CAS Inc., the LTPO Research, Development and Engineering Center, and other contractors to quickly isolate causes of phenomena that may be due to weather, atmospheric conditions, hardware faults, software problems, or operational procedures. This can lead to responsive changes that protect the force and enable warfighters to be more effective.

Without recorded data, analysts must speculate about observed problems, and in many cases it becomes impossible to

reproduce the anomaly or discover its cause. The net effect can be delays in adjusting to battlefield conditions, delays in correcting residual problems, and reduced combat effectiveness.

The commander and the soldiers are critical links in the potential benefits that can result from recorded data. The commander must emphasize the importance of data, and the soldiers must activate the recording of data and maintain the data recorders. To date, EDRs from Operation Iraqi Freedom have proven invaluable in assessing PATRIOT performance and in evaluating anomalous events.

In some cases the lack of recorded data has impacted analysts' ability to be as responsive as desired to some field reports. The EDRs are not considered mission-critical items. The troops can fight without data recording; however, the recorded data and the insight revealed on system performance could be critical to fighting effectively and surviving to fight tomorrow's battle.

This new technology provides literally a "foxhole-to-factory" means of obtaining data in a timely manner, and the ability to use such data as necessary for the support of our soldiers in the field. The chart below depicts technology in place today in remote locations throughout the world and the methodology used in transferring EDR data.

The IDSS program has truly been a team effort. PATRIOT's prime contractor, Raytheon, is responsible for the remote maintenance monitor and getting IDSS technology into the field. CAS, Inc., PATRIOT's System Engineering and Technical Assistance contractor, has played a major role in IDSS, assisting with the design and development of LANs, computer aided procedures for performing remotely controlled TMDE procedures, and secure satellite communications. At the U.S. Army Aviation and Missile Command Integrated Materiel Management Center, the Electronics Publications Division manages specialized publications needs. The logistics laboratory has been responsible for devel-

oping the video systems. Military users have played an active role in the definition of the system itself and how it should be used. Representatives of the allied nations using PATRIOT have been an integral part of joint efforts to guide the overall development of IDSS.

While challenges associated with integrating COTS/GOTS components exist, today's environment of funding constraints and streamlined acquisition dictates tailoring the use of commercial products and other integration of technologies as a mainstream approach to contain both cost and risk. Challenges will always exist to provide the soldier with tools, technology, and interfaces that are intuitive while at the same time imposing minimum impact to the existing support infrastructure. IDSS is meeting this challenge.

Editor's Note: The authors welcome questions or comments on this article. Contact them at James.McLinnaham@us.army.mil; or denis.beeler@cas-inc.com.

Current Data Transfer Process

